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AN EVALUATION OF THE EXHAUST EMISSIONS FROM TWO VEHICLES EQUIPPED WITH COMPRESSED NATURAL GAS CONVERSION KITS

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Environmental Protection Agency
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15. Supplementary Notes

16. Abstracts

An evaluation of the emission characteristics of two vehicles equipped with compressed natural gas conversions was made. The vehicles evaluated were a six cylinder Chevrolet and a four door Ford pickup truck, both of which used dual fuel conversions with modified Impco fuel systems, and both of which were capable of being driven on either gasoline or compressed natural gas. Two different driving cycles were used in the evaluation of these vehicles. In the first tests nine cycles of the seven mode 1970 Federal emission test driving schedule were used. For the other tests, the 1972 test procedure for certification of new vehicles was used. The tabulated results indicated the following conclusions: (1) the level of emission of the vehicles tested are below 1972 standards; (2) the level of emission of the vehicles tested are below the proposed 1975 standards.

17. Key Words and Document Analysis. 17a. Descriptors

Air pollution
Exhaust emissions
Automobiles
Trucks
Conversion
Natural gas
Tests
Sampling
Nitrogen oxides
Carbon monoxide
Carbon dioxide
Hydrocarbons
Standards

17b. Identifiers/Open-Ended Terms

Constant Volume Sampling (CVS)
Federal Test Procedure (1972)

17c. COSATI Field/Group 13B

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Vehicle Tested

An evaluation of the emission characteristics of two vehicles equipped with compressed natural gas conversions was made during the month of November. The first vehicle to be evaluated was a six cylinder Chevrolet. The second vehicle was a four door Ford pick-up truck. Both vehicles used dual fuel conversions with modified Impco fuel systems. Vehicles were capable of being driven on either gasoline or compressed natural gas.

Tests Conducted

Two different driving cycles were used in the evaluation of the compressed natural gas vehicle. In the first tests nine cycles of the seven mode 1970 Federal emission test driving schedule were used (9X7 CVS). For the other tests, the 1972 test procedure for certification of new vehicles was used. This driving schedule is non repetitive and simulates typical urban driving. During both tests exhaust was collected using the constant volume sampling technique as described in the November Federal Register. Oxides of nitrogen were analyzed using both an electro chemical technique and the wet chemical modified Saltzman method. Carbon monoxide and carbon dioxide were measured using non-dispersive infrared while unburned hydrocarbons were determined using a flame ionization detector.

Emission Results

The results reported in Table 1 compare the Ford Truck, using both gasoline and natural gas. All of the results are reported in grams per mile. As this is only a research cycle, there are no Federal standards. In Table 2 the emissions are reported as measured on the 1972 test procedure. The standards for 1972 with this cycle are hydrocarbon 3.4 grams per mile and carbon monoxide 39 grams per mile. All three tests show results under these levels. The standards for 1975 proposed in the July 1970 Federal Register are hydrocarbons 0.5 grams per mile, carbon monoxide 11 grams per mile and oxides of nitrogen 0.9 grams per mile. None of these vehicles meet these standards.

Conclusions

1. The level of emission of the vehicles tested are below 1972 standards.

2. The level of emission of the vehicles tested are above the proposed 1975 standards.

3. The reduction shown between gasoline and CNG on the Ford truck is less than normally expected and may be due to the dual fuel system being used.

TABLE 1

Constant Volume Sampling Using 1970 Driving Cycle
(9X7 CVS)

Ford Truck

	Gasoline	Natural Gas
Hydrocarbons	3.9	3.1
Carbon Monoxide	23	10
Carbon Dioxide	533	448
Oxides of Nitrogen*	7.4	5.2
Oxides of Nitrogen**	5.4	4.1

Results Reported in Grams Per Mile

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*NOx Box results reported as NO_2
**Saltzman results reported as NO_2

TABLE 2

1972 Federal Test Procedure
LA4

	Chevy 6 Cylinder	Ford Truck	
	Natural Gas	Gasoline	Natural Gas
Hydrocarbons	2.1	3.0	3.0
Carbon Monoxide	3.8	21	25
Carbon Dioxide	434	466	633
Oxides of Nitrogen*	4.6	---	---
Oxides of Nitrogen**	2.0	2.8	4.6

Results Reported in Grams Per Mile

*NOx Box results reported as NO_2.
**Saltzman results reported as NO_2.